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Attorney Docket: 1458P
PATENT

Transmitted herewith for filing is the Patent Application of

Inventor: **Roland F. Portman and Edgar Jhay Gregorios**

REMOVABLE VISUAL INDICATION STRUCTURE FOR A PRINTED CIRCUIT BOARD

Enclosed with the Patent Application are:

- ☒ Six (6) sheets of informal drawings
- ☒ Combined Declaration/Power of Attorney by Inventor(s)
- ☒ Declaration Claiming Small Entity Status
- ☒ Assignment and Recordation Form
- ☐ Information Disclosure Statement (PTO Form 1449)
- ☐ A certified copy of a _____ application.
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The filing fee has been calculated as shown below:

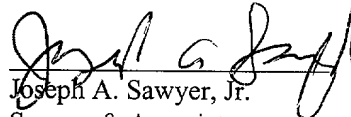
(Col. 1)		(Col. 2)	SMALL ENTITY	
FOR:	NO. FILED	NO. EXTRA	RATE	FEE
BASIC FEE				\$ 345.00
TOTAL CLAIMS	25 - 20	= 5	x 9 =	\$ 45.00
INDEP. CLAIMS	4 - 3	= 1	x 39 =	\$ 39.00
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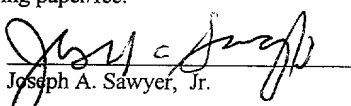
Respectfully submitted,

SAWYER AND ASSOCIATES
P.O. BOX 51418
Palo Alto, California 94303
(650) 493-4540


Joseph A. Sawyer, Jr.
Sawyer & Associates
Attorney for Applicants
Reg. No. 30,801

EXPRESS MAIL CERTIFICATE

I hereby certify that the above paper/fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated below and is addressed to the Commissioner of Patents and Trademarks, Washington, DC 20231. "Express Mail" no.: EL547854456US. Date of Deposit: February 15, 2000. Signature of person mailing paper/fee:


Joseph A. Sawyer, Jr.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Portman, et al.

Serial No.:

Filed: February 15, 2000

For: REMOVABLE VISUAL INDICATION
STRUCTURE FOR A PRINTED CIRCUIT
BOARD

**DECLARATION CLAIMING SMALL ENTITY
STATUS UNDER 37 CFR 1.9(f) and 1.27(c)
SMALL BUSINESS CONCERN**

I hereby declare that I am

- ☐ the owner of the small business concern identified below:
☒ an official of the small business concern empowered to act on behalf of the concern
identified below:

NAME OF CONCERN
ADDRESS OF CONCERN

BITMICRO NETWORKS, Inc.
48499 Milmont Drive
Fremont, California 94538

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal years, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled **REMOVABLE VISUAL INDICATION STRUCTURE FOR A PRINTED CIRCUIT BOARD** by inventor(s) Roland E. Portman and Edgar Jhay Gregorios, described in the application filed herewith.

The rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this declaration is directed.

NAME OF PERSON SIGNING:

Rodolfo H. Bruce

TITLE OF PERSON OTHER THAN OWNER:

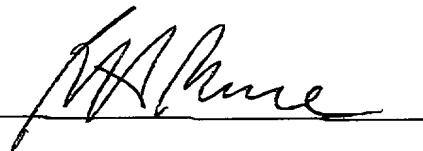
President

ADDRESS OF PERSON SIGNING:

48499 Milmont Drive

Fremont, California 94538

SIGNATURE:



DATE:

2/15/2000

REMOVABLE VISUAL INDICATION STRUCTURE FOR A PRINTED CIRCUIT BOARD

CROSS REFERENCE TO RELATED APPLICATIONS

The present application is related to co-pending application Serial No. (JAS 1318P), entitled "Printed Circuit Board Assembly" filed on the same day and assigned to the same Assignee as the present application.

FIELD OF THE INVENTION

The present invention relates generally to printed circuit board assemblies and more particularly to a removable visual indication structure for a printed circuit board.

BACKGROUND OF THE INVENTION

Computer systems continually require more functionality, more memory and faster operational speeds, and in many cases they need these features in smaller physical packages. To meet these requirements, the packaging density of the printed circuit board (PCB) assemblies of those computer systems increases accordingly. Therefore printed circuit board space must be efficiently utilized.

The PCB assemblies employed by these computer systems generally include a controller board that incorporates light emitting diodes (LEDs). These LEDs act as visual indicators to notify a computer user when certain components of the computer system are operating (i.e., when the system bus is active, when the processor is active, etc.).

Figure 1 shows a typical printed circuit controller board 10. The printed circuit controller board 10 includes LEDs 12 and a plurality of header pins 14. The LEDs act as

visual indicators for the board 10 and are permanently attached thereto. The plurality of header pins 14 are provided as a connection means for manufacturers to remotely place additional LEDs. Manufacturers can accordingly utilize flat ribbon cable or similar means to remotely place additional LEDs when incorporating the board 10 with their computer systems. Figure 2 shows a typical flat ribbon cable connector 16. However, once a manufacturer remotely places the additional LEDs, the permanently attached LEDs are no longer needed. Thus, the printed circuit board space being utilized by the permanently attached LEDs is ultimately wasted.

Consequently, what is needed is a visual indication system that increases the amount of space available on the printed circuit board. The present invention addresses such a need.

SUMMARY OF THE INVENTION

In a first aspect of the present invention, a removable visual indication structure is disclosed. The removable visual indication structure in accordance with the present invention comprises a removable connection portion and a visual indication portion coupled to the removable connection portion wherein the visual indication structure can be removably attached to a printed circuit board.

In a second aspect of the present invention, a printed circuit board system is disclosed. The system in accordance with the present invention comprises a printed circuit board, at least one pin coupled to the printed circuit board, and at least one removable visual indication structure coupled to the at least one pin.

In yet a third aspect of the present invention, a method for fabricating a removable visual indication structure is disclosed. The method in accordance with the present

invention comprises the steps of providing at least one visual indicator, providing a removable connector adapted to be coupled to the printed circuit board, and coupling the at least one visual indicator to the removable connector.

Accordingly, the present invention provides a simple and cost effective way for manufacturers to provide visual indicators to various types of systems while at the same time increasing the amount of space available on the printed circuit board.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the typical printed circuit controller board.

Figure 2 shows a typical flat ribbon cable connector.

Figure 3 is a flowchart of the method for fabricating a removable visual indication structure in accordance with the present invention.

Figures 4(a-b) show an LED structure in accordance with the present invention.

Figures 5(a-d) illustrate top, side, bottom and perspective views of the LED structure in accordance with the present invention.

Figure 6 illustrates a variety of different configurations of the LED structure in accordance with the present invention.

DETAILED DESCRIPTION

The present invention relates to a removable visual indication structure for a printed circuit board. The following description is presented to enable one of ordinary skill in the art to make and use the invention and is provided in the context of a patent application and its requirements. Various modifications to the preferred embodiment and the generic principles

and features described herein will be readily apparent to those skilled in the art. Thus, the present invention is not intended to be limited to the embodiment shown but is to be accorded the widest scope consistent with the principles and features described herein.

The present invention is disclosed in the context of a preferred embodiment. The preferred embodiment of the present invention provides a removable visual indication structure for a printed circuit board. Accordingly, the present invention provides a simple and cost effective way for manufacturers to provide visual indicators to various types of systems while at the same time increasing the amount of space available on the printed circuit board.

For a further understanding of the present invention please refer now to Figure 3. Figure 3 is a flowchart of the method for fabricating the removable visual indication structure in accordance with the present invention. First, a visual indicator is provided, via step 20. Preferably the visual indicator is an LED type visual indicator. Next, a removable connector adapted to be coupled to a printed circuit board is provided, via step 22. This is preferably a surface mount type connector. Finally, the visual indicator is then coupled to the connector, via step 24. This is preferably accomplished by soldering the visual indicator to the back of the surface mount connector.

Although the preferred embodiment of the present invention utilizes soldering means to couple the visual indicator to the removable connector, one of ordinary skill in the art will readily recognize that a variety of coupling means could be utilized to couple the visual indicator to the removable connector while remaining within the spirit and scope of the present invention.

For a better understanding of the present invention please refer to Figures 4(a-b).

Figure 4(a) shows an LED structure 30 in accordance with the present invention. Figure 4(b) shows the components of the LED structure 30 in accordance with the present invention. The structure 30 comprises an LED portion 32 and a removable connector portion 34. The LED portion 32 is preferably a surface mount LED and the removable connector portion 34 is preferably a surface mount connector. Accordingly, the LED portion 32 is coupled to the removable connector portion 34 thereby producing the LED structure 30.

Although the preferred embodiment of the present invention contemplates the utilization of an LED type visual indicator, one of ordinary skill in the art will readily recognize that a variety of visual indicators (incandescent lamps, neon lamps, etc.) could be implemented while remaining within the spirit and scope of the present invention.

For a more detailed description of the present invention please refer now to Figures 5(a-d). Figures 5(a-d) illustrate top, side, bottom and perspective views of the LED structure in accordance with the present invention. Figure 5(a) is a top view of the surface mount connector 40. Figure 5(b) shows a side view of a surface mount connector 40' wherein an LED 42 has been coupled thereto. Figure 5(c) shows a bottom view of a surface mount connector 40''. Figure 5(c) illustrates sockets 44 wherein the surface mount connector 40'' can be removably attached to a printed circuit board via a plurality of header pins located on the printed circuit board. Finally, Figure 5(d) is a perspective view of the structure in accordance with the present invention.

For an even further description of the present invention please refer to Figure 6. Figure 6 shows a variety of configurations wherein LED structures 50, 52, 54, 56 in accordance with the present invention are removably attached to printed circuit boards 60, 62, 64, 66 via pluralities of pins 70, 72, 74, 76. As can be seen in Figure 5, the LED structures 50, 52, 54, 56

in accordance with the present invention are shown incorporating 1-4 LEDs. However, one of ordinary skill in the art will readily recognize that any number of LEDs can be incorporated while remaining within the spirit and scope of the present invention.

Because the LED structures 50, 52, 54, 56 include sockets, they can be easily removed. As a result, a printed circuit board employing an LED structure in accordance with the present invention only uses the space necessary for one plurality of header pins since the plurality of header pins can be used for the LED structure in accordance with the present invention and for a flat ribbon cable connector. Therefore, manufacturers needing to remotely place their own visual indicators can simply remove the LED structure and attach a flat ribbon cable connector or similar means onto the plurality of header pins.

Consequently, the printed circuit board space normal required for permanently attached LEDs is no longer needed for that purpose. As a result, the amount of available printed circuit board space is increased. This additional printed circuit board space can be subsequently utilized for adding more significant components (memory chips, interface chips, transistors, etc.). Although the present invention has been described in accordance with the embodiments shown, one of ordinary skill in the art will readily recognize that there could be variations to the embodiments and those variations would be within the spirit and scope of the present invention. For example, the present invention could be utilized with any type of system requiring visual indication and should not be limited to computer systems.

Accordingly, many modifications may be made by one of ordinary skill in the art without departing from the spirit and scope of the appended claims.

CLAIMS

What is claimed is:

1 1. A removable visual indication structure comprising:
2 a removable connection portion; and
3 a visual indication portion coupled to the removable connection portion,
4 wherein the visual indication structure can be removably attached to a printed circuit board.

1 2. The removable visual indication structure of claim 1 wherein the visual
2 indication portion comprises a Light Emitting Diode (LED).

1 3. The removable visual indication structure of claim 2 wherein the LED
2 comprises a surface mount LED.

1 4. The removable visual indication structure of claim 3 wherein the removable
2 connection portion comprises a surface mount connector.

1 5. The removable visual indication structure of claim 4 wherein the LED is
2 soldered to the surface mount connector.

1 6. The removable visual indication structure of claim 5 wherein the LED is
2 soldered to the backside of the surface mount connector.

1 7. A removable visual indication structure for use with a printed circuit board
2 comprising:
3 a removable connector adapted to be attached to the printed circuit board; and
4 at least one visual indicator coupled to the removable connector.

1 8. The removable visual indication structure of claim 7 wherein the at least one
2 visual indicator comprises an LED.

1 9. The removable visual indication structure of claim 8 wherein the LED
2 comprises a surface mount LED.

1 10. The removable visual indication structure of claim 9 wherein the removable
2 connector comprises a surface mount connector.

1 11. The removable visual indication structure of claim 10 wherein the LED is
2 soldered to the surface mount connector.

1 12. The removable visual indication structure of claim 11 wherein the LED is
2 soldered to the backside of the surface mount connector.

1 13. A printed circuit board system comprising;
2 a printed circuit board;
3 at least one pin coupled to the printed circuit board; and

4 at least one removable visual indication structure coupled to the at least one
5 pin.

1 14. The system of claim 13 wherein the at least one removable visual indication
2 structure comprises:

3 a removable connector adapted to be attached to the printed circuit board; and
4 at least one visual indicator coupled to the removable connector.

1 15. The system of claim 14 wherein the at least one visual indicator comprises an
2 LED.

1 16. The system of claim 15 wherein the LED comprises a surface mount LED.

1 17. The system of claim 16 wherein the removable connector comprises a surface
2 mount connector.

1 18. The system of claim 17 wherein the LED is soldered to the surface mount
2 connector.

1 19. The system of claim 18 wherein the LED is soldered to the backside of the
2 surface mount connector.

1 20. A method for fabricating a removable visual indication structure for a printed

2 circuit board comprising the steps of:

- 3 (a) providing at least one visual indicator;
- 4 (b) providing a removable connector adapted to be coupled to the printed circuit
- 5 board; and
- 6 (c) coupling the at least one visual indicator to the removable connector.

1 21. The method of claim 20 wherein the at least one visual indicator comprises an
2 LED.

1 22. The method of claim 21 wherein the LED comprises a surface mount LED.

1 23. The method of claim 22 wherein the removable connector comprises a surface
2 mount connector.

1 24. The method of claim 23 wherein step (c) further comprises:

- 2 (c1) soldering the LED to the surface mount connector.

1 25. The method of claim 24 wherein the LED is soldered to the backside of the
2 surface mount connector.

ABSTRACT

In a first aspect of the present invention, a removable visual indication structure is disclosed. The removable visual indication structure in accordance with the present invention comprises a removable connection portion and a visual indication portion coupled to the removable connection portion wherein the visual indication structure can be
5 removably attached to a printed circuit board. In a second aspect of the present invention, a printed circuit board system is disclosed. The system in accordance with the present invention comprises a printed circuit board, at least one pin coupled to the printed circuit board, and at least one removable visual indication structure coupled to the at least one pin. In yet a third aspect of the present invention, a method for fabricating a removable visual
10 indication structure is disclosed. The method in accordance with the present invention comprises the steps of providing at least one visual indicator, providing a removable connector adapted to be coupled to the printed circuit board, and coupling the at least one visual indicator to the removable connector. Accordingly, the present invention provides a
15 simple and cost effective way for manufacturers to provide visual indicators to various types of systems while at the same time increasing the amount of space available on the printed circuit board.

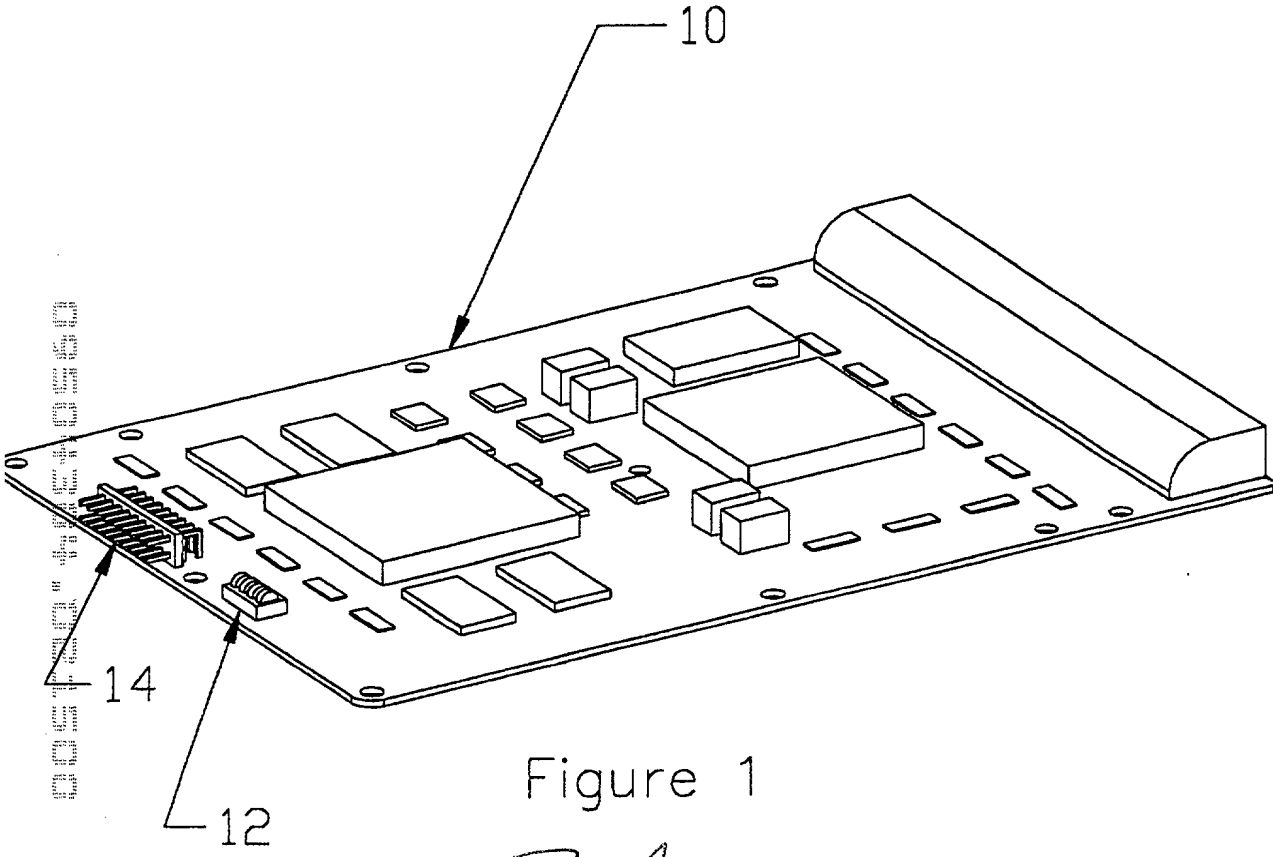


Figure 1
Prior Art

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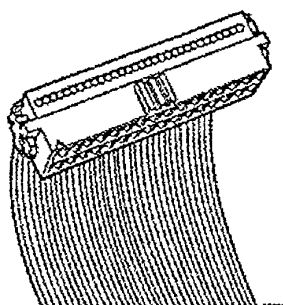


Figure 2
Prior Art

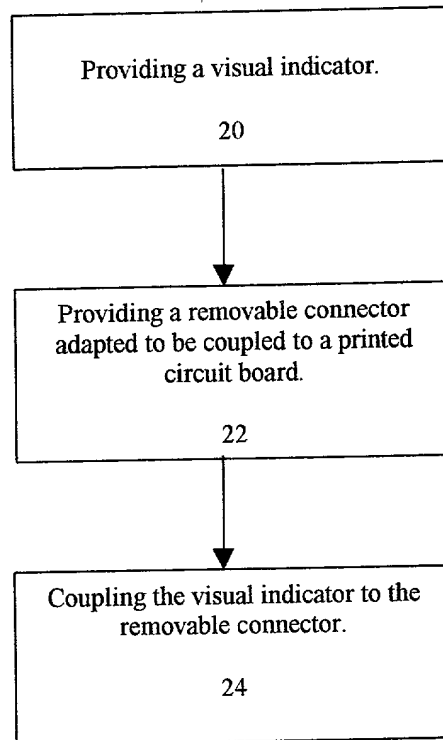
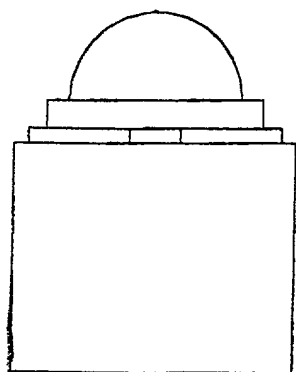
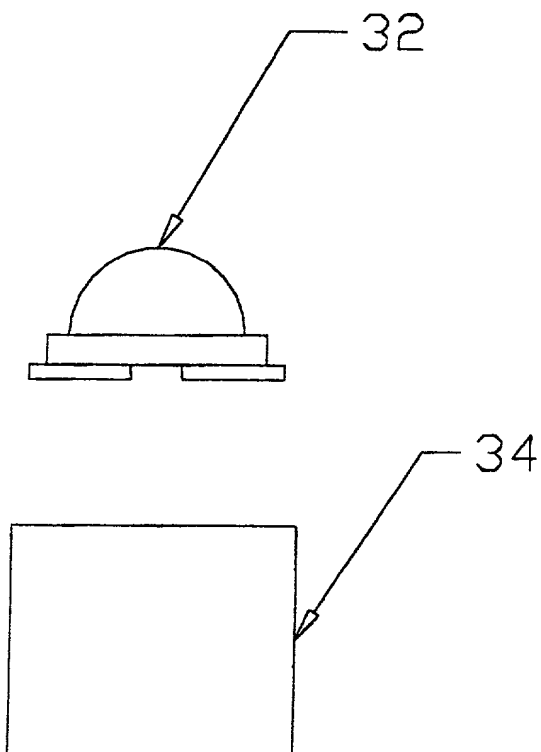


Figure 3



30

Figure 4(a)



32

34

Figure 4(b)

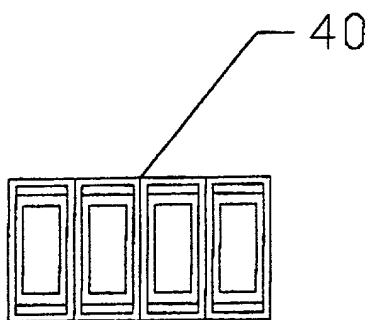


Figure 5(a). Top View

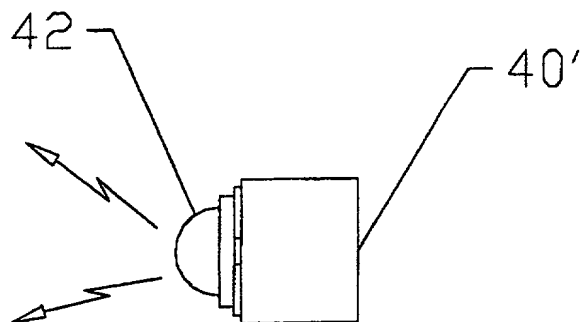


Figure 5(b). Side View

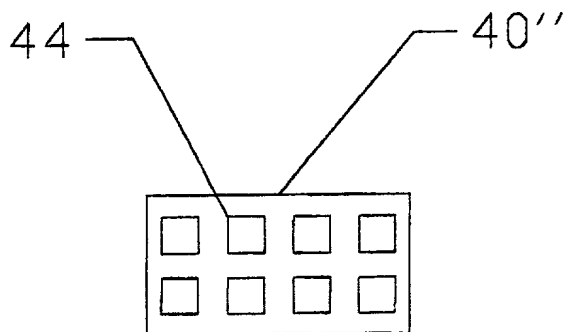


Figure 5(c). Bottom View

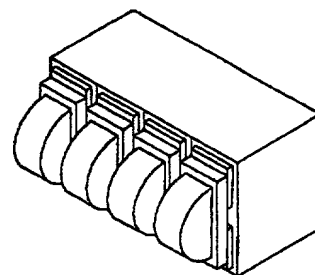


Figure 5(d). Perspective View

This diagram shows an exploded perspective view of a multi-layer printed circuit board (PCB) assembly. The assembly consists of four main PCB layers, labeled 60, 62, 64, and 66, which are stacked vertically. Each layer has mounting holes along its edges. Various electronic components are shown in their relative positions for assembly:

- Component 50:** A rectangular component with a grid of pins or contacts on its bottom surface, positioned to be mounted on the bottom layer (60).
- Component 70:** A component with multiple pins, positioned to be mounted on the bottom layer (60).
- Component 72:** A component with multiple pins, positioned to be mounted on the second layer from the bottom (62).
- Component 74:** A component with multiple pins, positioned to be mounted on the third layer from the bottom (64).
- Component 76:** A component with multiple pins, positioned to be mounted on the top layer (66).
- Component 52:** A small circular component, positioned to be mounted on the bottom layer (60).
- Component 54:** A small circular component, positioned to be mounted on the second layer from the bottom (62).
- Component 56:** A small circular component, positioned to be mounted on the third layer from the bottom (64).

The components are shown in their relative positions for assembly, with lines indicating their alignment with the mounting holes on the PCB layers.

Figure 6

DECLARATION AND POWER OF ATTORNEY FOR UTILITY PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name,

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

REMOVABLE VISUAL INDICATION STRUCTURE FOR A PRINTED CIRCUIT BOARD

the specification of which

X is attached hereto.

___ was filed on _____.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I do not know and do not believe that the same was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and said invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

I acknowledge the duty to disclose information which is material to the examination and patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56 (a).

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119, of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed		
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	Yes	_____ No	_____
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	Yes	_____ No	_____

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

_____ (Application Serial No.)	_____ (Filing Date)	_____ (Status -- patented, pending, abandoned)
_____ (Application Serial No.)	_____ (Filing Date)	_____ (Status -- patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name and registration number).

Joseph A. Sawyer, Jr. Reg. No. 30,801
Stephen G. Sullivan, Reg. No. 38,329
Wendell J. Jones, Reg. No. P45,961

Janyce R. Mitchell, Reg. No. 40,095
Michele Liu, Reg. No. P44,875

as my attorney with full power of substitution and revocation to transact all business in the United States Patent and Trademark Office connected herewith.

Send all correspondence to: **Joseph A. Sawyer, Jr.**
SAWYER & ASSOCIATES
Post Office Box 51418
Palo Alto, California 94303

Direct all telephone calls to: **Joseph A. Sawyer, Jr. at (650) 493-4540**

Full Name of first Inventor: **Roland F. Portman**

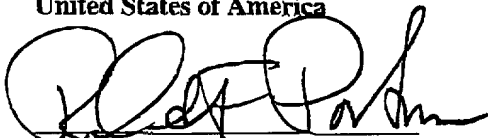
Residence Address: **3001 Warrenton Court**
Pleasanton Alameda California 94588
City County State Zip

Post Office Address: **SAME**

Citizenship: **United States of America**

Feb 15, 2000

Date


Signature of Inventor

Full Name of second Inventor: **Edgar Jhay Gregorios**

Residence Address: **1367 Gentry Lane**
Tracy San Joaquin California 95376
City County State Zip

Post Office Address: **SAME**

Citizenship: **United States of America**

FEB 15, 2000

